U.S. DEPARTMENT OF ENERGY | Office of Science

Intensity Frontier

DOE-PI Meeting at DPF 2017

Michael Cooke
Program Manager
Office of High Energy Physics
Office of Science, U.S. Department of Energy

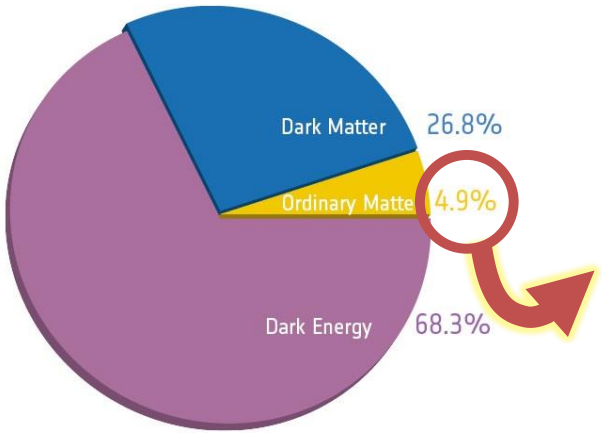
The High Energy Physics Program Mission

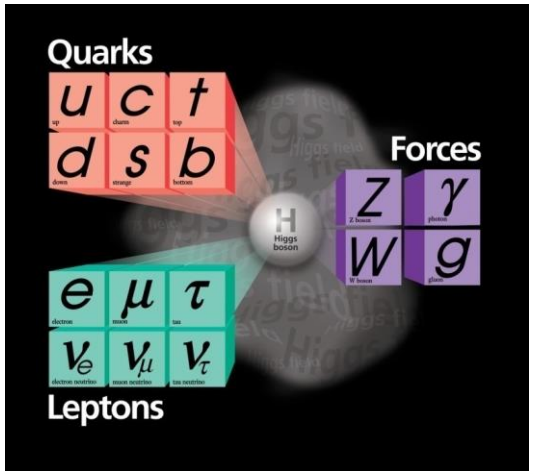
…is to understand how the universe works at its most fundamental level:

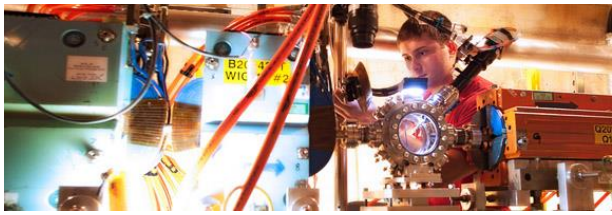
- Discover the elementary constituents of matter and energy
- Probe the interactions between them
- Explore the basic nature of space and time

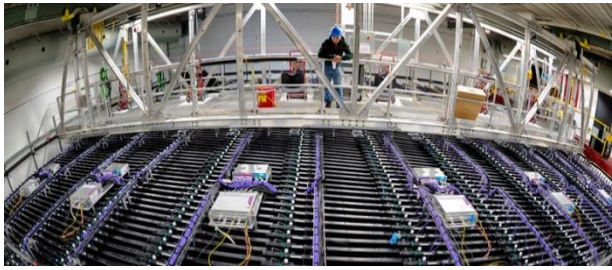
The Office of High Energy Physics fulfills its mission by:

- Building **projects** that enable discovery science
- Operating **facilities** that provide the capability to perform discovery science
- Supporting a **research** program that produces discovery science



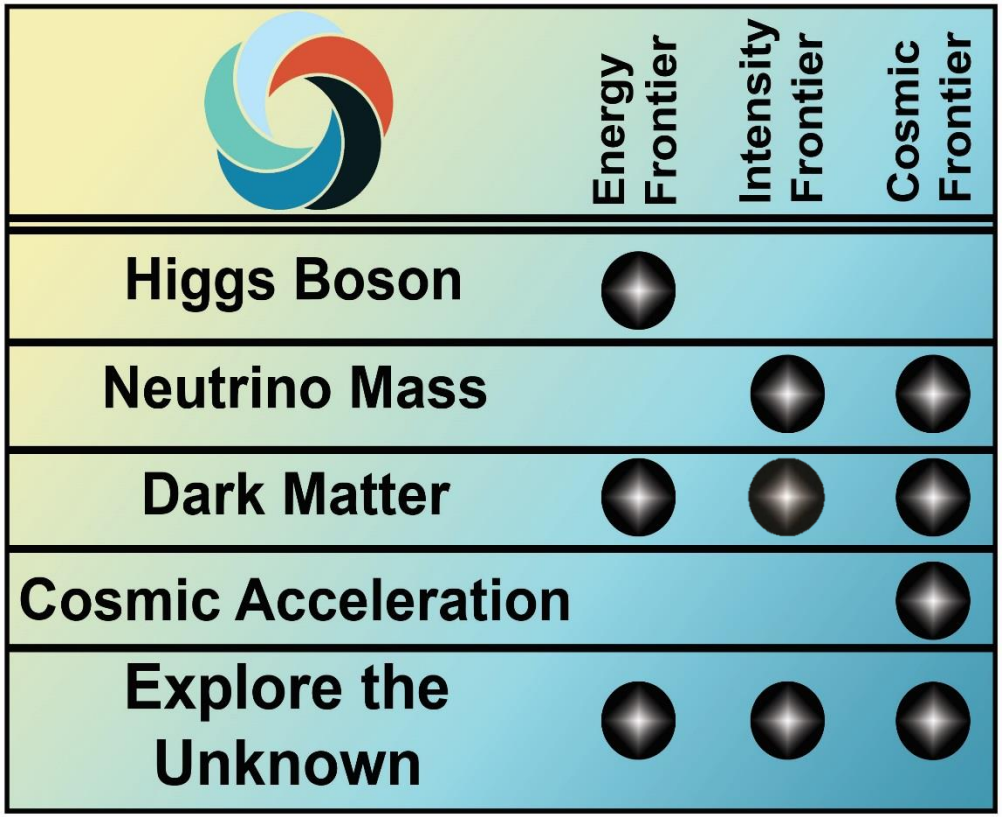


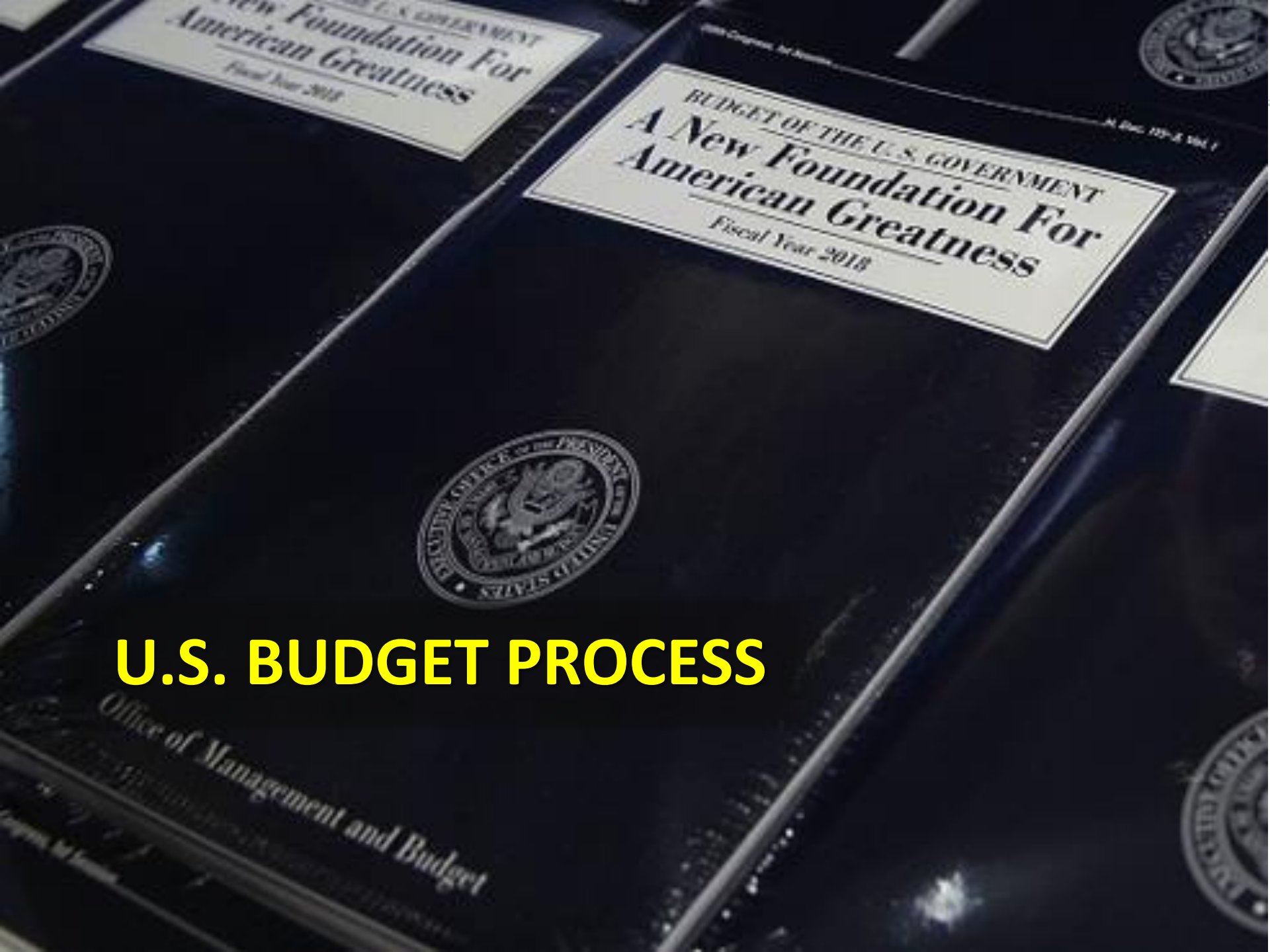




Enabling the Next Discovery

- **Science drivers identify the scientific motivation**
- **Research Frontiers are useful categorization of experimental techniques and serve as the basis of the budget process**
- **Research Frontiers are complementary**
  - No one Frontier addresses all science drivers
  - Each Frontier provides a different approach to address science driver
  - Enables cross-checking scientific results

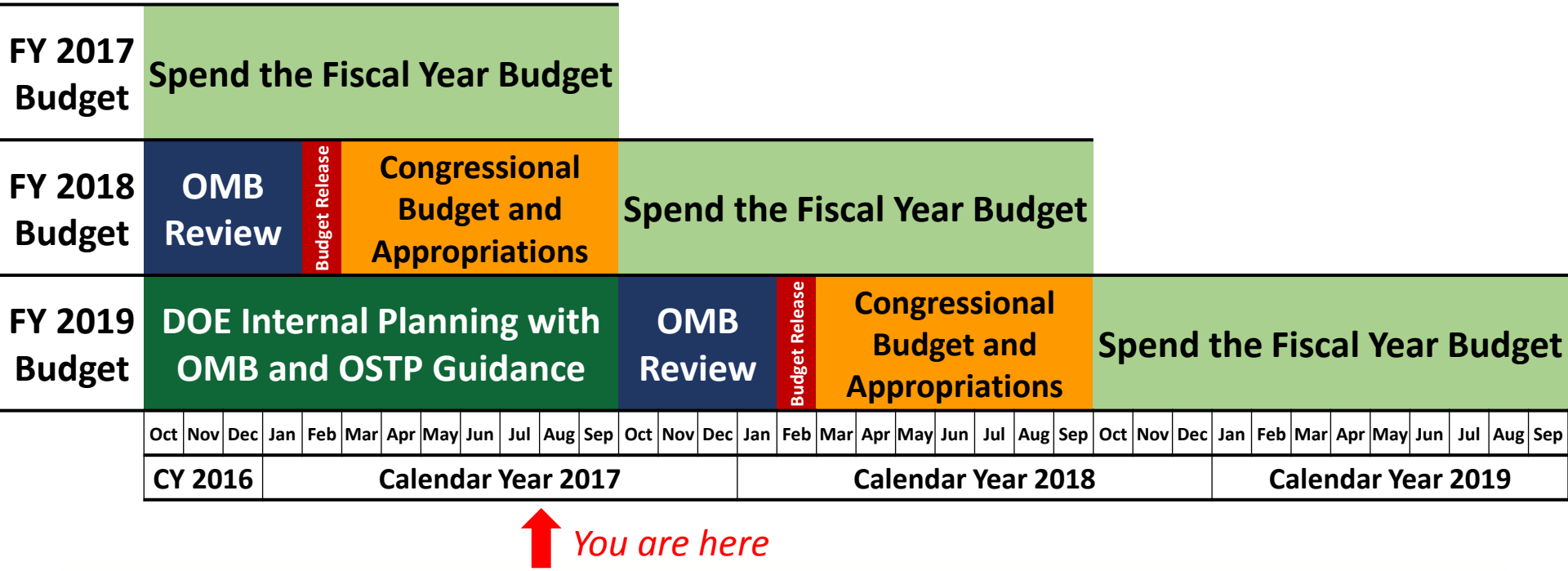




U.S. BUDGET PROCESS

The U.S. Federal Budget Cycle

- **Typically, three budgets are being worked on at any given time**
  - Executing current Fiscal Year (FY; October 1 – September 30)
  - White House Office of Management and Budget (OMB) review and Congressional Appropriation for coming FY
  - Agency internal planning for the second FY from now



You are here

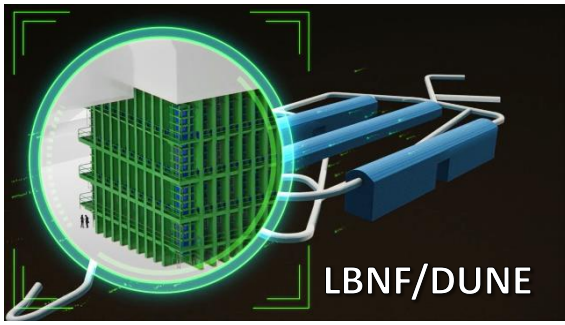
HEP FY 2018 President's Budget Request

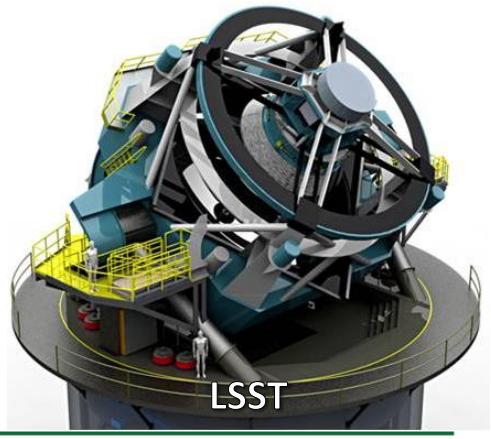
HEP Funding *($ in thousands)*	FY 2016 Enacted	FY 2017 Annualized CR	FY 2017 Enacted	FY 2018 Request	FY 2018 vs. FY 2016		FY 2018 vs. FY 2017 Enacted	
Research	341,663	352,344	347,852	272,887	-68,776	-20%	-74,965	-21%
Facility/Operations	258,236	252,084	255,162	213,813	-44,423	-17%	-41,349	-16%
Projects & Constr.	195,101	189,061	221,986	186,000	-9,101	-4%	-35,986	-16%
Total	**795,000**	**793,489**	**825,000**	**672,700**	**-122,300**	**-15%**	**-152,300**	**-18%**

- **The 2018 President's Budget Request for HEP is an overlay of Administration, DOE Office of Science, and P5 priorities**
- **FY18 Budget Request reduces near-term science for P5-guided investments in mid- and long-term program**
  - All **projects** continue, some with delays
  - **Research** maintained at 40% of the program budget, but Request will reduce activities at the National Labs and Universities, with higher priority given to:
    - Laboratory research programs that are critical to executing the P5 recommendations
    - R&D that requires long-term investments (i.e., "seeding the future") including Accelerator Stewardship, Detector R&D, and Quantum Information Science (QIS)
  - **Operations** support for ongoing experiments reduced to make this possible
- **The new administration supports the overall P5 strategy**

HEP FY18 President's Budget Highlights

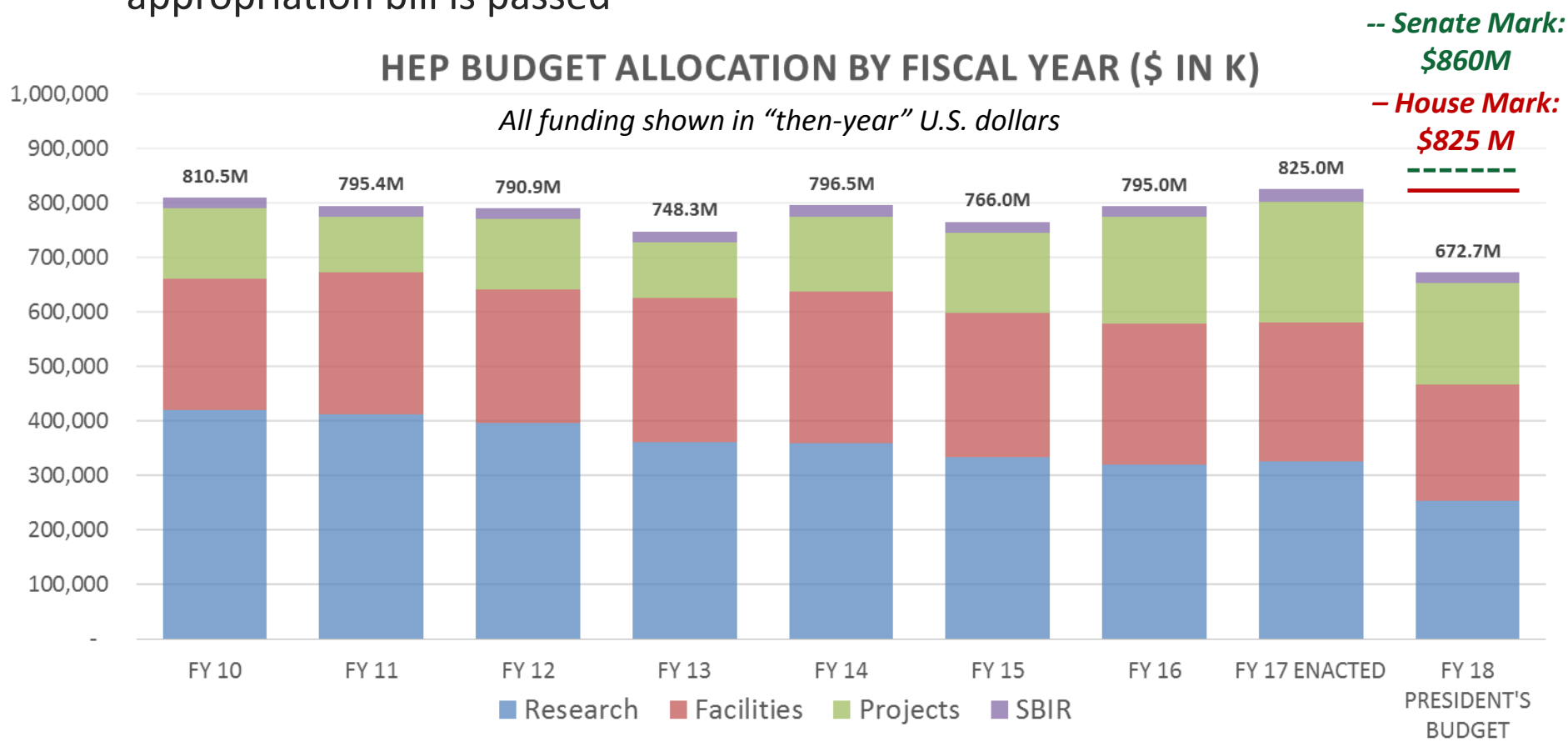
- **Energy Frontier: Actively engage in successful LHC program and High-Luminosity LHC (HL-LHC) upgrades**
  - P5's highest priority near-term large projects are the High-Luminosity Large Hadron Collider (HL-LHC) Accelerator Upgrade (new MIE start) and HL-LHC ATLAS & CMS detector upgrades
- **Intensity Frontier: Support establishing a U.S.-hosted world-leading neutrino program**
  - LBNF/DUNE is the highest P5 priority in its time frame and FY 2018 investments in initial far-site construction are crucial to enable scheduled delivery of contributions from international partners
- **Cosmic Frontier: Advance understanding of dark matter and dark energy**
  - P5 recommended a complementary suite of projects to study dark matter and dark energy and to support CMB experiments as part of core program





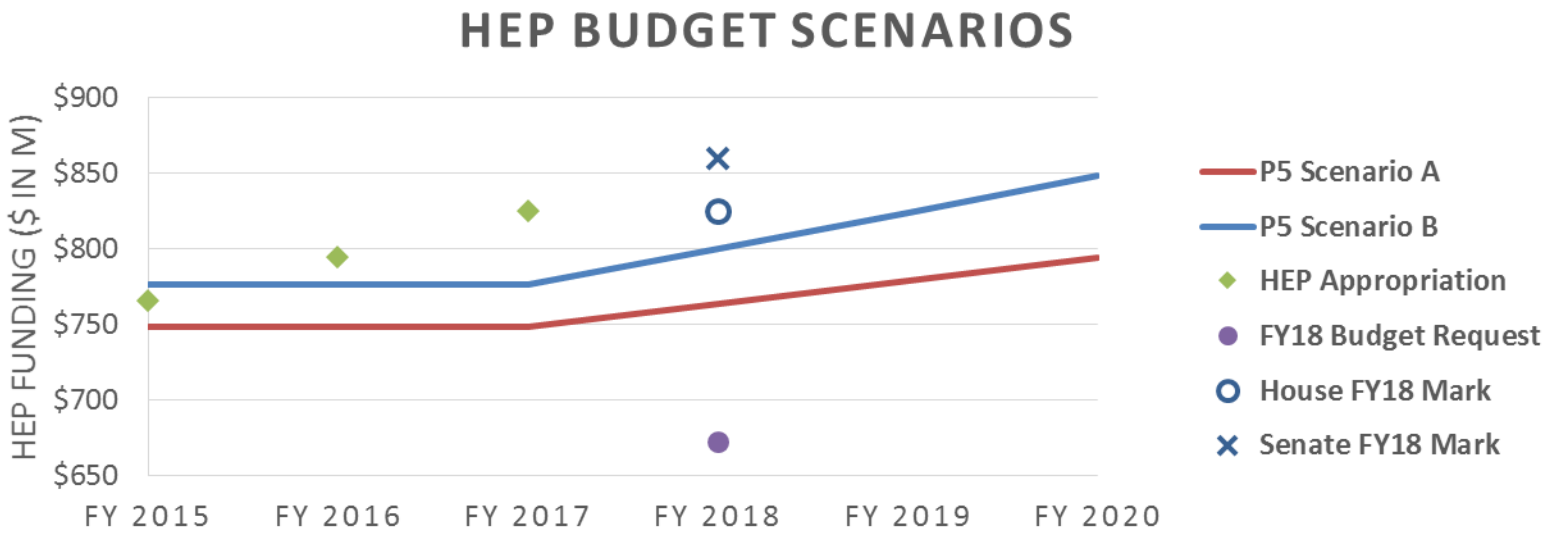
Overall HEP Budget Trend

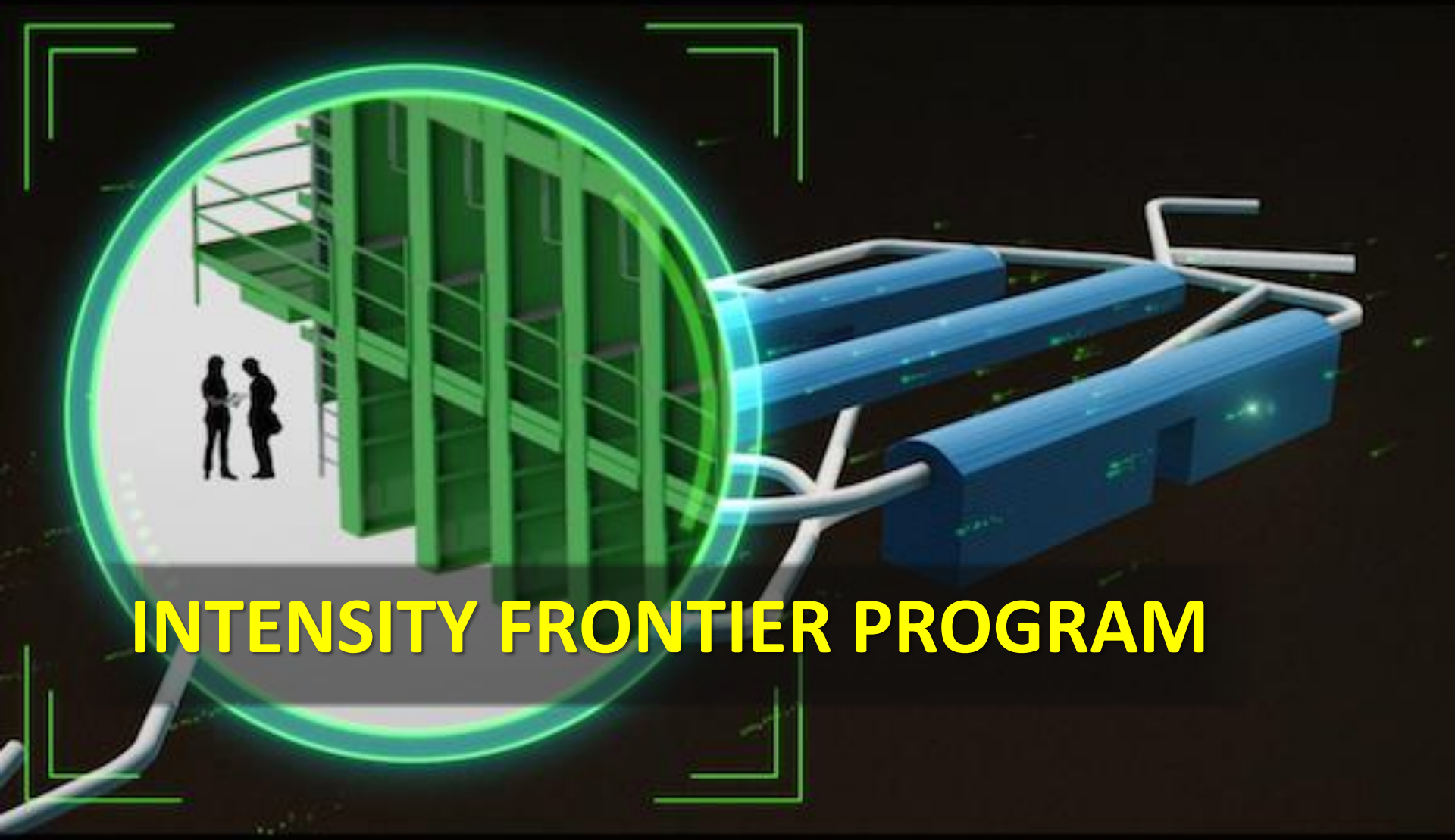
- **P5 strategy continues to define investments in future of the field**
- **Current draft of House FY18 appropriations bill is flat with FY17**
  - Congressional marks are a budget indicator, but funding level not set until appropriation bill is passed



HEP Budget vs. P5 Funding Scenarios

- **P5 was charged to consider three 10-year budget scenarios for HEP within the context of a 20-year vision for the global field**
  - Scenario A was the lowest constrained budget scenario
  - Scenario B was a slightly higher constrained budget scenario
  - Scenario C was "unconstrained," but not considered unlimited
- **FY 2018 appropriations process is progressing**
  - President's Budget Request was released on May 23
  - Congressional Appropriations Committees are drafting legislation
  - Final language of appropriations bill (and report) impact how funding is directed




INTENSITY FRONTIER PROGRAM

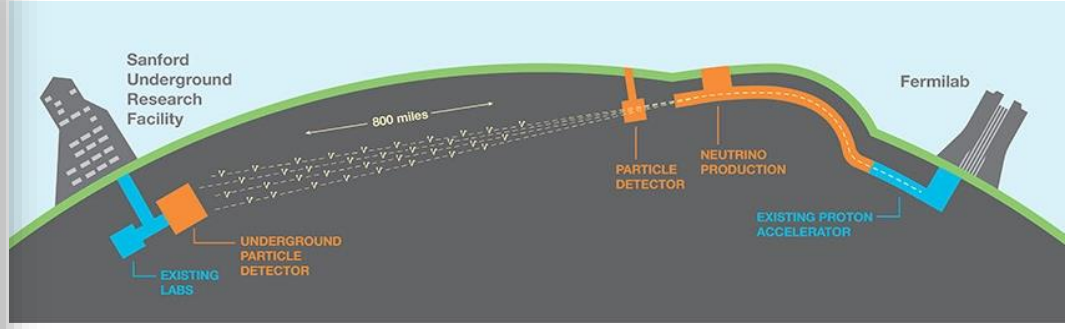
Intensity Frontier Program

Intensity Frontier experiments address the P5 Science Drivers through intense beams and sensitive detectors

- **Exploring the unknown through precision measurements:** *Muon g-2, Mu2e, Belle II, K0TO*
- **Identify the new physics of dark matter:** *Heavy Photon Search*
- **Pursuing the physics associated with neutrino mass:** *NOvA*, *Daya Bay*, *MINERvA*, *Super-K*, *T2K* ongoing; ramping up Fermilab Short-Baseline Neutrino Program (*MicroBooNE*, *SBND*, *ICARUS*)

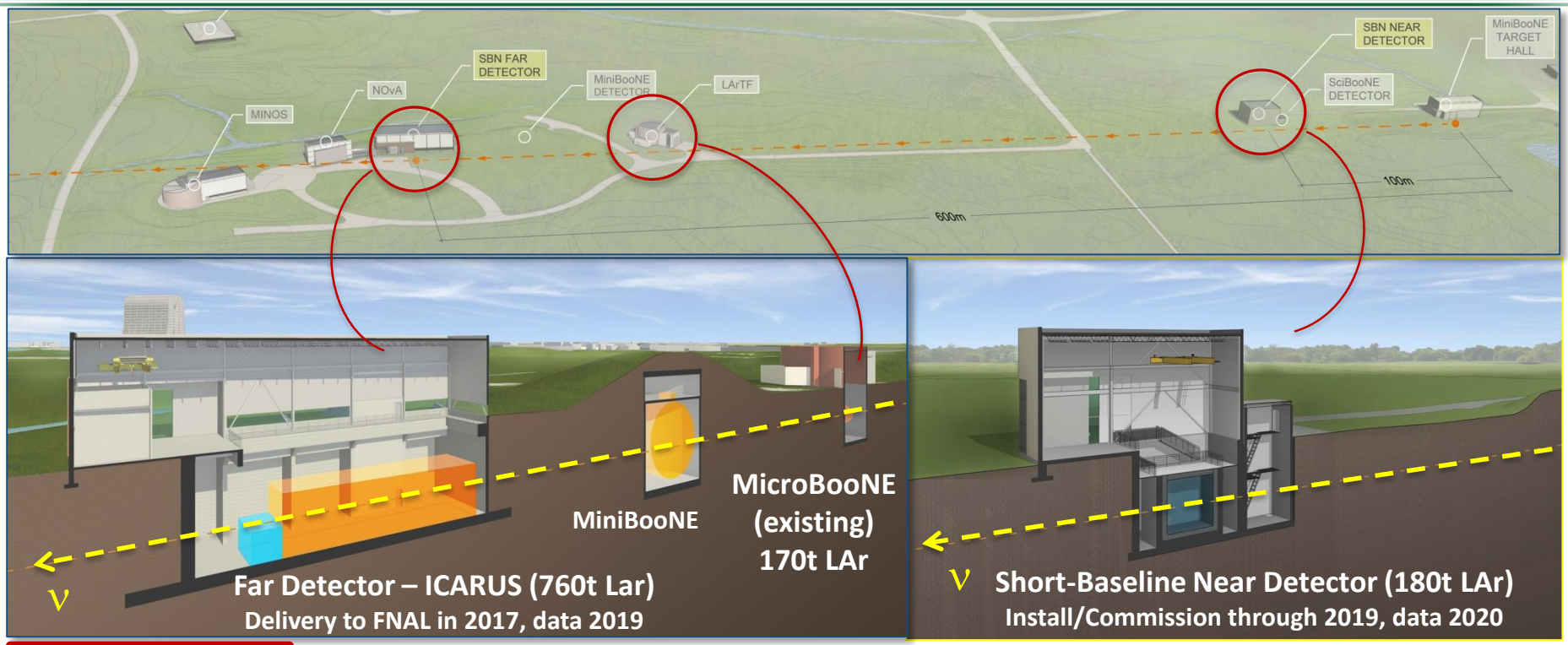
P5 recommended *Long Baseline Neutrino Facility (LBNF)* as the centerpiece of a U.S.-hosted world-leading neutrino program, recognizing it as the highest-priority large project in its timeframe

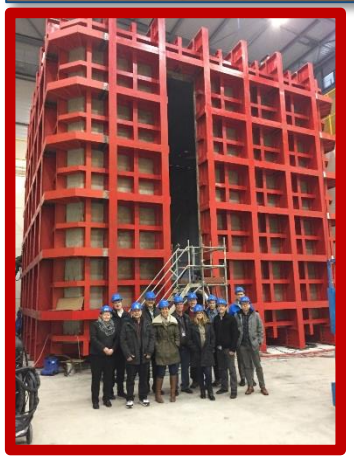
- **Given the compelling discovery potential, Fermilab is working closely with CERN and other global partners to establish a truly international "mega-science" facility with first physics in the mid-2020s**
  - Currently, over 980 collaborators from 164 institutions in 31 countries
- ***LBNF* will produce the world's most intense neutrino beam and send it 800 miles through the earth**
- **The *Deep Underground Neutrino Experiment (DUNE)* will be a large (40 kiloton) liquid argon neutrino detector located nearly 1 mile underground at the Sanford Underground Research Facility**
  - Groundbreaking for *LBNF/DUNE* far-site construction held on July 21, 2017



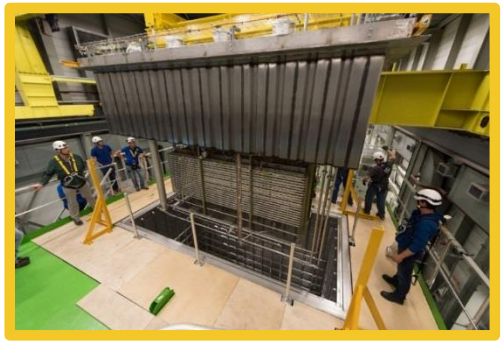
Science and Technology Advance Towards LBNF/DUNE:

Fermilab Short-Baseline Neutrino Program and ProtoDUNEs





CERN: Single-phase ProtoDUNE



CERN: Dual-phase ProtoDUNE Test Cryostat Insertion

- Fermilab Short-Baseline Neutrino Program will search for additional, "sterile" neutrinos while advancing detector technology for DUNE
- CERN Neutrino Platform will include 2 test beams and 2 cryostats for testing of full-scale DUNE prototypes (ProtoDUNEs)

IF Highlight: #IcarusTrip

Transatlantic Voyage

IF Highlight: #IcarusTrip

Intensity Frontier Science

Experiment	Location	Science Goals
ANNIE	Fermilab, Batavia, IL, USA	Study neutrino-nucleus interactions in a Water Cherenkov detector using new photodetector technology
Belle II	KEK, Tsukuba, Japan	Physics of the bottom and charm quarks and the tau lepton; CP asymmetries; new states of matter
COHERENT	Spallation Neutron Source, ORNL, Oak Ridge, TN, USA	Detect coherent elastic neutrino-nucleus scattering
Daya Bay	Dapeng Penisula, China	Measure $\sin^2 2\theta_{13}$ within 3%; precise measurement of atmospheric mass splitting
EXO-200	Waste Isolation Pilot Plant, Eddy County, NM, USA	Search for neutrinoless double beta decay. (Note; nEXO will be supported by DOE Office of Nuclear Physics)
Heavy Photon Search	Jefferson Lab, Newport News, VA, USA	Search for massive vector gauge bosons which may be evidence of dark matter or explain g-2 anomaly
ICARUS	Fermilab, Batavia, IL, USA	Search for sterile neutrinos in LArTPC
K0TO	J-PARC, Tokai , Japan	Discover and measure $K_L \rightarrow \pi^0 \nu\nu$ to search for CP violation
LArIAT	Fermilab, Batavia, IL, USA	Characterize LArTPC performance with a test beam at energies relevant to short- and long-baseline neutrino expts.
LBNF/DUNE	Fermilab, Batavia, IL & Homestake Mine, SD, USA	Discover and characterize CP violation in the neutrino sector; comprehensive program to measure neutrino oscillations, proton decay, and supernova neutrinos
MicroBooNE	Fermilab, Batavia, IL, USA	Address MiniBooNE low energy excess; measure neutrino cross sections in LArTPC
MINERvA	Fermilab, Batavia, IL, USA	Precise measurements of neutrino-nuclear effects and cross sections at 2-20 GeV
Mu2e	Fermilab, Batavia, IL, USA	Charged lepton flavor violation search for $\mu N \rightarrow eN$
Muon g-2	Fermilab, Batavia, IL, USA	Definitively measure muon anomalous magnetic moment
US-NA61	CERN, Geneva, Switzerland	Measure hadron production cross sections crucial for neutrino beam flux estimations
NOvA	Fermilab, Batavia, IL & Ash River, MN, USA	Measure ν_μ-ν_e and ν_μ-ν_μ oscillations; resolve the neutrino mass hierarchy; explore δ_{cp} (with T2K)
PROSPECT	High Flux Isotope Reactor, ORNL, Oak Ridge, TN, USA	Search for sterile electron antineutrino oscillation at very short baseline
SBND	Fermilab, Batavia, IL, USA	Precision neutrino-LAr interaction measurements
Super-K	Mozumi Mine, Gifu, Japan	Nucleon decay, supernova neutrinos, atmospheric neutrinos
T2K	J-PARC, Tokai & Mozumi Mine, Gifu, Japan	Measure ν_μ-ν_e and ν_μ-ν_μ oscillations; resolve the neutrino mass hierarchy; explore δ_{cp} (with NOvA)

Intensity Frontier: Status & Outlook

Project	TPC ($M)	CD Status	CD Date
Long Baseline Neutrino Facility / Deep Underground Neutrino Experiment (LBNF/DUNE)	1,300 – 1,900	CD-3A	September 1, 2016
Proton Improvement Project (PIP-II)	465-650	CD-0	November 12, 2015
Muon g-2	46.4	CD-3	August 20, 2015
Muon-to-Electron Conversion Experiment (Mu2e)	273.677	CD-3	July 14, 2016

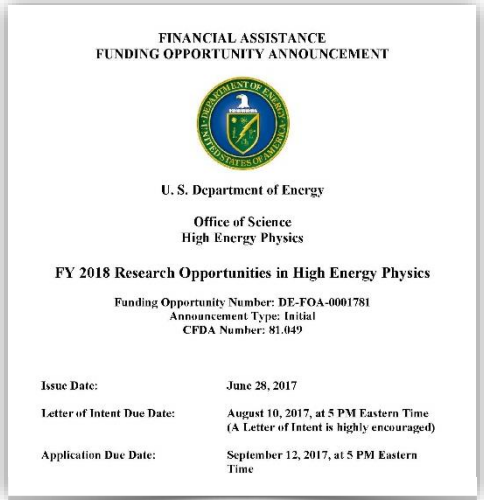
- **Neutrino program will continue to advance and produce science results in FY18**
  - NOvA will be in its fourth year of data taking
  - Fermilab SBN: physics results from MicroBooNE, ICARUS begins data taking, SBND commissioning
  - ProtoDUNE will take data in the CERN beam in FY 2018
- **Precision measurement program will continue to advance and produce science results in FY18**
  - Results from Fermilab Muon g-2 experiment anticipates results from first physics data (just saw first beam!)
  - Belle II will take first data at the SuperKEKB accelerator in Japan
  - R&D, physics studies, and detector simulations will continue for Mu2e
- **Mu2e follows planned fabrication funding profile in FY18 Request**
- **In FY17, Congress provided LBNF/DUNE with an increase of $4.9M over the Request**
- **FY18 Request slows LBNF/DUNE investment growth vs. CD-3A**
  - FY 2018 investments enable international contributions on schedule, but delays project completion
- **FY18 Request delays PIP-II vs. CD-1 schedule**
- **FY18 Request provides reduced funding for the Fermilab Accelerator Complex**
  - Proposal to run 1,800 hours of Fermilab Accelerator Complex operations (37.5% of optimal 4,800) will require further discussion with Fermilab regarding program impacts


HEP FUNDING OPPORTUNITIES

FY18 HEP Comparative Review FOA and FAQ

- **DE-FOA-0001781 issued June 28, 2017**
- **Six HEP research subprograms**
  - Energy, Intensity, and Cosmic Frontiers
  - HEP Theory
  - Accelerator Science and Technology R&D
  - Detector R&D
- **Letter of Intent due August 10, 2017 by 5 PM Eastern Time**
  - Strongly encouraged
- **Final Proposal deadline September 12, 2017 by 5 PM Eastern Time**
- **In addition to the FOA, a FAQ is available and addresses topics on:**
  - Registration and eligibility requirements
  - Proposal types and proposal requirements;
  - Guidance for new faculty and those without current HEP grants
  - Guidance for PIs with existing HEP grants
  - Budget information and guidance on scope of request(s)
  - Letter of Intent
  - Information on overall scientific merit review process
  - Contacts for program- or system-related questions

Both the FOA and FAQ available at:
http://science.energy.gov/hep/funding-opportunities/



FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

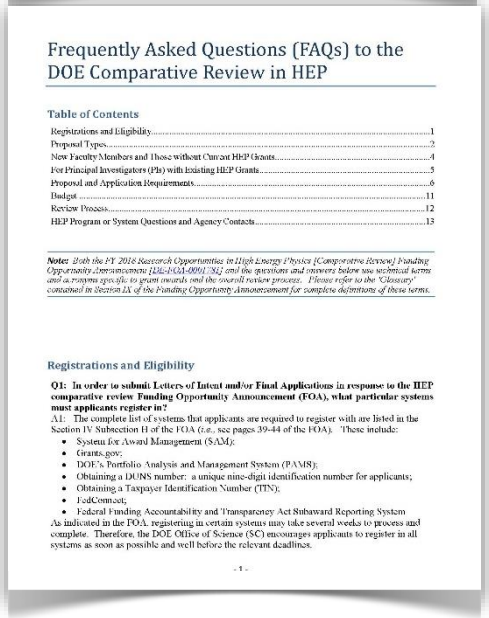
U. S. Department of Energy

Office of Science
High Energy Physics

FY 2018 Research Opportunities in High Energy Physics

Funding Opportunity Number: DE-FOA-0001781
Announcement Type: Initial
CFDA Number: 81.049

Issue Date:	June 28, 2017
Letter of Intent Due Date:	August 10, 2017, at 5 PM Eastern Time (A Letter of Intent is highly encouraged)
Application Due Date:	September 12, 2017, at 5 PM Eastern Time



Frequently Asked Questions (FAQs) to the DOE Comparative Review in HEP

Table of Contents

Note: Both the FY 2018 Research Opportunities in High Energy Physics [Comparative Review] Funding Opportunity Announcement [DE-FOA-0001781] and the questions and answers below use technical terms and acronyms specific to grant awards and the overall review process. Please refer to the 'Glossary' contained in Section IX of the Funding Opportunity Announcement for complete definitions of these terms.

Registrations and Eligibility

Q1: In order to submit Letters of Intent and/or Final Applications in response to the HEP comparative review Funding Opportunity Announcement (FOA), what particular systems must applicants register in?

A1: The complete list of systems that applicants are required to register with are listed in the Section IV Subsection H of the FOA (i.e., see pages 39-44 of the FOA). These include:

- System for Award Management (SAM);
- Grants.gov;
- DOE's Portfolio Analysis and Management System (PAMS);
- Obtaining a DUNS number: a unique nine-digit identification number for applicants;
- Obtaining a Taxpayer Identification Number (TIN);
- FedConnect;
- Federal Funding Accountability and Transparency Act Subaward Reporting System

As indicated in the FOA, registering in certain systems may take several weeks to process and complete. Therefore, the DOE Office of Science (SC) encourages applicants to register in all systems as soon as possible and well before the relevant deadlines.

DOE HEP Research Priorities: Snapshot

- **Energy Frontier**
  - Analysis of LHC Run 2 data
  - Contribute to operational responsibilities and complete "Phase I" upgrades
  - Scientific support for HL-LHC program
- **Intensity Frontier**
  - Neutrino Program
    - Support ProtoDUNE, LBNF/DUNE, and PIP-II
    - Implement Fermilab Short-Baseline Neutrino Program and Intermediate Neutrino Program
    - NOvA, T2K/SK, Minerva, MicroBooNE data analysis
  - Muon Program: Complete Mu2e, take data with Muon g-2
  - Heavy Flavor Program: Complete Belle-II and take data
- **Cosmic Frontier**
  - Dark Matter: Complete G1 analysis, construct G2 experiments, modest R&D
  - Dark Energy: Complete eBOSS, DES analysis; construct LSST and DESI
  - Continue planning for CMB-S4
- **Accelerator R&D**
  - Focus on outcomes and capabilities that will dramatically improve cost effectiveness for mid-term and far-term accelerators
  - Hosting workshops to develop and implement R&D plan following P5 and GARD panels
- **Detector R&D**
  - In process of seeking community input to identify highest priority R&D activities in wake of P5
  - Long-term "high-risk" R&D with potential for wide applicability and/or high-impact
  - "Blue-Sky" scientific research on innovative technologies not already in contention for implementation in future DOE HEP projects
- **HEP Theory**
  - Maintain an overall "thriving" program as per P5

HEP Research Activities Supported

- **What DOE supports**
  - Research efforts (mainly scientists) on R&D, experiment design, fabrication, installation, physics commissioning, data-taking, analysis-related activities
  - Theory, simulations, phenomenology, computational studies
  - Some engineering support may be provided for R&D and pre-project, generally through Detector R&D
    - Support depends on merit review process and programmatic factors
- **Faculty support**
  - Support of up to 2-months summer salary based on merit reviews and/or optimizing the number of research personnel supported by financial assistance awards
    - Must ensure that sufficient effort (from the PI or others) is being provided to make the research feasible
  - Principal Investigator's research effort commitment is an integral part of the award
    - Indicated in the approved budget pages, which becomes part of the legal agreement of the award
- **Research Scientists**
  - Support may be provided, but due to long-term expectations, need to consider case-by-case on merits:
    - Roles/responsibilities well-matched with individual capabilities? Cannot be fulfilled by a term position?
  - Efforts are related towards research, not long-term operations and/or project activities
- **What's not supported by research grants**
  - Any significant experimental operations and/or project-related (CD0+) activities:
    - Engineering, major items of equipment, consumables for prototyping or production
  - Non-HEP related efforts
    - Gravity waves (LIGO), Heavy Ion (RHIC or LHC), Polar Science, AMO Science, Astronomy
    - Neutrinoless double beta decay is under the DOE Office of Nuclear Physics

Programmatic Considerations

- **Generally very useful to have head-to-head reviews of PIs working in similar areas, particularly for large grants**
  - Discussion of relative strengths and weaknesses of individual proposals and PIs

- **Many factors weigh into final funding decisions**
  - ***Compelling research*** proposal for next ~3 years
    - ✓ **Interesting? Novel? Significant? Plausibly achievable?**
    - ✘ **Incremental? Implausibly ambitious? Poorly presented?**
  - ***Significant contributions*** in last 3-4 years
    - Synergy and collaboration within group (as appropriate)
    - Contributions to the research infrastructure of experiments
  - ***Alignment with HEP*** programmatic priorities
  - ***Balanced program*** of R&D/design, support of construction or operations, data analysis
    - This may span multiple experiments over a 3 year proposal

- **Supportive of excellent people, including excellent *new* people, even when times are tough!**

Particular Considerations for DUNE

- **Compelling research proposal for next ~3 years**
  - ✓ **Demonstrable impact** on DUNE R&D/fabrication plan or performance
  - ✓ **Supports current timeline** for DOE CD's or other milestones
  - × **Outside of DUNE plan**, not timely, or no clear leadership role
  - × **Project** activities
- **Significant recent contributions in last 3–4 years**
  - Should be able to show science impact/leadership in neutrino physics and/or detector development
- **Alignment with programmatic priorities**
  - ✓ Highest priority HEP project in its time frame
- **Balanced program of R&D/design, support of construction or operations (ProtoDUNE), data analysis**
  - DUNE research program will be focused on first item in next ~2–3 years
  - PIs should look to other experiments for additional operations or analysis elements during this period

Comparative Merit Review Criteria

For Reviewers/Panelists

- **Merit review criteria and corresponding questions are given to all reviewers to use in preparing their reviews**
  - Serves as a guide to address each review criteria for written reviews
- **Are highlighted by DOE PMs at the beginning of panel deliberations**
- **Are presented and discussed by individual panelists for each proposal**

For Principal Investigators

- **The merit review criteria items and corresponding questions are given in Section V of the FOA**
  - Serves as an additional guide for PIs to address in their proposal's project narratives
- **PIs should integrate and adapt these (as appropriate) when narrating the group's activities and research plans**
  - Do not write an explicit paragraph answering each question!

Comparative Merit Review Criteria

- **SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH**
  - What is the scientific scope and impact of the proposed effort? **How might the results of the proposed work impact the direction, progress, and thinking in relevant scientific fields of research?** What is the likelihood of achieving valuable results? How does the merit of the proposed research, both **in terms of scientific and/or technical merit and originality**, compare with other efforts within the same research area for a) applications submitted to this FOA and b) those in the overall HEP field? Is the Data Management Plan suitable for the proposed research and to what extent does it support the validation of research results?
- **APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH**
  - Does the proposed effort employ **innovative concepts or methods**? How logical and feasible are the approaches? Are the conceptual framework, methods, and analyses well justified, adequately developed, and **likely to lead to scientifically valid conclusions**? Does the applicant recognize **significant potential problems** and consider alternative strategies?
- **COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES**
  - How well qualified is each senior investigator and their team, and **what is the likelihood of success** in carrying out the proposed work? Does the proposed work take advantage of **unique facilities and capabilities**? What is the past scientific performance of the team, including the dissemination of results? Are any proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate? Are the environment and facilities adequate for performing the proposed effort, including any **synergistic opportunities, institutional support, and/or infrastructure**? Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field? For senior investigator(s) proposing to work across multiple research thrusts, are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?
- **REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET**
  - **Are the proposed budget and staffing levels adequate to carry out the proposed work?** If multiple research thrusts are proposed, is the balance of proposed efforts reasonable and well-matched to the proposed research goals? Are all travel, student costs, and other ancillary expenses adequately estimated and justified? **Is the budget reasonable and appropriate for the scope?**
- **RELEVANCE OF THE PROPOSED RESEARCH TO THE HEP PROGRAM PRIORITIES**
  - How does the proposed research of each senior investigator **contribute to the mission, science goals, and programmatic priorities** of the subprogram in which the application is being evaluated? Is the proposed research consistent with HEP's overall priorities and strategic plan? For multi-thrust proposals, does the scope of the full proposed program **provide synergy or additional benefits to the HEP mission beyond the individual thrusts**? How likely is the research **to impact the direction of the overall HEP program**? For senior investigator(s) proposing to work and/or transition across multiple research thrusts during the project period, will their overall efforts add value in the broader context of HEP program goals?

Key Items to Keep in Mind

- **Proposed research will review best if closely aligned with the DOE/HEP mission, its program, and the Particle Physics Project Prioritization Panel (P5) strategy**
  - Investigators in experimental HEP research frontiers (Energy, Intensity, Cosmic) will review best if they are closely integrated into HEP experiment collaborations and have key roles and responsibilities on those experiments
  - "Generic" research that is not to be carried out as part of a specific HEP experimental collaboration should be directed to the HEP Theory or Detector R&D programs, as appropriate

- **Read the FOA carefully and follow the requirements on content, length, etc.**
  - Several requirements in the FOA are set from outside the DOE/HEP office, and there is little to no flexibility to modify. **Non-compliant proposals submitted to the FOA will not be reviewed.**
  - In recent years, **10-15% of incoming proposals are declined without review.** Requirements that are most often missed or overlooked include:
    - Data management plans, page limits, separate budget sheets for each frontier (if needed), and inclusion of Personally Identifiable Information (PII)

Recent FOA Changes

- **All *Research* proposals to DOE/SC must have a Data Management Plan (DMP)**
  - Includes HEP comparative review and Early Career, but not conferences, workshops, operations, projects
  - Any research thrust in a proposal without a DMP will be **declined without review**
- **All *Renewal* proposals must submit "proposal products" (publications, etc.) after the application is submitted**
  - PIs will be notified by PAMS and have 5 days to respond
  - We **cannot review** incoming proposals until this step is completed
  - These will eventually be captured with your annual Progress Report, but must be entered by hand during the transition phase
- **Eligible Applications (*new in FY 2018*):**
  - "All applications … **requesting support for more than one person** must propose a Program Director/Principal Investigator who is currently in a **tenure-track appointment**."
- **Recurring Submissions of Research Applications (*new in FY 2018*):**
  - "A previously declined application may be resubmitted to this FOA, but **only after it has undergone substantial revision**. An application submitted to this FOA that has not clearly taken into account the major concerns from prior DOE reviews may be **declined without review and will not be considered for funding**."
- **All FOAs have different eligibility, technical requirements, page limits, etc.**
  - ***Read the instructions carefully!***

Proposal Project Narrative

- **Project Narrative comprises the research plan for the project**
  - Should contain enough background material in the introduction to demonstrate sufficient knowledge of the research
  - Devote main portion to a description and justification of the proposed project, include details of the methods to be used and any relevant results
  - Indicate which project personnel will be responsible for which activities
  - Include timeline for the major activities of the proposed project
- **Must not exceed 9 pages per senior investigator when printed on standard 8 ½" x 11" paper with 1-inch margins (all sides). Font must not be smaller than 11 point.**
  - Senior investigator ≡ active tenured or tenure-track faculty member at sponsor institution
  - Non-tenure track faculty (*e.g.*, research scientists) or senior research staff with term appointments are not included in the 9-page limit per senior investigator unless they are the sole senior investigator on the application
  - Faculty members at collaborating institutions listed on the proposal are not included
- **Refer to Section IV of the FOA for useful information to help prepare the narrative**
  - What to address for the Background/Introduction
  - Multiple Investigators and/or Multiple Research Subprograms or Thrusts
  - Common narrative with overview of each group's activities in different research areas
  - Discussion of any synergies and connections between areas
  - Proposed Project Objectives, Research Methods, Resources
  - Timetable and Level of Effort of different activities, …

Office of Science (SC): Data Management Plan (DMP)

- **Focus of Digital Data Management is the sharing and preservation of digital research data**
  - Data management involves all stages of the digital data life cycle including capture, analysis, sharing, and preservation
  - See Dr. Laura Biven's presentation on SC Digital Data Management, Sept. 2014 HEPAP meeting: http://science.energy.gov/hep/hepap/meetings/201409/
  - FOAs issued after October 1, 2014 require a DMP and compliance with the SC Statement
    - SC statement on DMP available at: http://science.energy.gov/funding-opportunities/digital-data-management/
    - See Section IV, the subsection on Appendix 8 of the FOA, for requirements pertaining to DMPs that must be included in your application
- **Most experiments have developed DMPs for their collaborations**
  - When applying for financial assistance (or submitting FWPs), PIs can cite the DMPs for their experiments with the appropriate links
    - If DMP cited, PIs must briefly describe how proposed research relates to the experiment
  - Theorists need DMPs: explain how theoretical/simulated data can be accessed/validated
  - If there is no data of any sort generated by the proposed research, the DMP must state this. **A DMP that is blank or states "not applicable" is not acceptable**

Each research thrust in a proposal requesting DOE research support, including the FY 2018 Comparative Review FOA, will require addressing the DMP requirements for it to be reviewed, and hence, to be considered for funding

Renewal Proposal Products

- **If you have received an award through the Comparative Review process, you are likely submitting a "Renewal" proposal**
  - Contact your PM if you have a question as to whether it is more appropriate to submit a "New" or "Renewal" proposal
- **Renewal Proposal Products [see Section II.G of the FY17 comp rev FOA]**
  - Since Feb 2015, PI must complete and submit 'Renewal Proposal Products' section in PAMS by entering each product created during the course of the previous project period
    - Details with step-by-step instruction set in PAMS Users' Guide, Sec. 9.2: https://pamspublic.science.energy.gov/WebPAMSEPSExternal/CustomInterface/Common/ExternalUserGuide.pdf
  - Types of products include:
    - Publications (for collaborators on large experiments, list those where you were primary)
    - Intellectual property, technologies or techniques
    - Databases or software (made public)
- **Renewal Proposal Products are submitted after the application submission**
  - DOE will assign the renewal proposal to a Program Manager, resulting in an automated email from PAMS to the PI with instructions ←***watch for this email in your inbox***
  - Navigate in PAMS to 'Tasks' and enter all products within 5-days after the proposal submission
  - Application will not be considered complete and therefore cannot be reviewed until the product list has been submitted

Research Scientists (RS)

- **Panel will evaluate RS efforts where support is requested in a proposal**
- **Guidance to PIs given in Q&A of FAQ**
  - Requests to support RS dedicated full-time (and long-term) to operational and/or project activities for an experiment will not be supported by respective frontier research areas
  - If RS conducting physics research-related activities, requests [scaled to % of time on such efforts] can be included
    - Any final support will be **based on the merit review** process
- **Common [past] reviewer comments that result in unfavorable merit reviews:**
  - "RS conducting scope of work typically commensurate at the postdoctoral-level…"
  - "RS involved in long-term ops/project activities with minimum physics research efforts…"
    - Such efforts may review well in the operation/project program but **not in a review of the experimental research program**
- **What are "physics research-related activities?"**
  - Object reconstruction/algorithm development, performance studies, data taking and analysis, and mentorship of students & postdocs in these areas
  - Scientific activities in support of detector/hardware design and development
- **From the research program, cases become an issue when operations/projects become the dominant activity in the long-term**
  - A well-balanced portfolio that includes physics research-related activities is encouraged
  - **Important to narrate complete plans** in 2-page "appendix narrative" + provide 1-page bio

Cross-cut or Transitional Proposals

- **Applications where a PI is proposing to conduct research across multiple HEP research subprograms during the project period will be considered**
- **PIs are encouraged to submit only one application, describing:**
  - Overall research activity, including fractional time planned in each subprogram
  - **FOA requirement:** In proposal's Budget Justification material (Appendix 7), include level of effort table for any transitions of effort during project period, as appropriate
- **As part of the comparative review process, DOE PMs will provide the panel with details regarding research plans that cross multiple HEP thrusts**
- **Reviewers with appropriate topical expertise in the research area(s) will assess the full scope, relevance, and impact of the proposed research in the merit review process — e.g., merit review questions consider:**
  - Are the plans for such cross-cutting efforts reasonably developed and will the proposed activities have impact?
  - Does the scope of the full proposed program provide synergy or additional benefits to the HEP mission beyond the individual thrusts?
  - Will PI's overall efforts across multiple thrusts add value in the context of HEP program goals and mission?
  - Is there a clear plan to ramp down effort in one area in order to pick up new research scope in another area?

Guidance Checklist for Comparative Review

- **As a convenience and courtesy, DOE/HEP has provided a checklist in the FOA**
  - The list, on the opening pages of the FOA, is not intended to be complete; applicants should review the FOA in-detail and follow all instructions

FY 2018 Comparative Review FOA – GUIDELINE FOR APPLICATION REQUIREMENTS	COMPLETED
Is the proposed research scope aligned with programmatic priorities of DOE-HEP?	☑
Personally Identifiable Information (PII): Do not supply any information, such as birth date or place, citizenship, home address, personal phone nos., etc., that should not enter into the merit review.	☑
A Data Management Plan is required for each research thrust (*e.g.,* ATLAS, LSST, lattice gauge theory, etc.). It must appear in Appendix 8 of the application and comply with page-limit requirements specified in the FOA.	☑
Project Summary/Abstract Page: contains the name(s) of the applicant, the project director/principal investigator(s) and the PD/PI's institutional affiliation, and any Co-Investigators and their affiliations.	☑
DOE Cover Page: list each HEP research subprogram (*e.g.,* Energy Frontier, HEP Theory) for which funding is requested. If there is more than one, be sure to attach the Cover Page Supplement.	☑
Page limits for each section comply with the FOA requirements (as defined in Section IV of the FOA).	☑
Biographical sketches carefully follow the FOA instructions and avoid PII.	☑
Current and Pending Support information completed, including an abstract of the scope of work.	☑
In addition to the budget information for the full proposal: separate budget and budget justification narratives for each HEP research subprogram in the proposal for each year in which funding is being requested and for the cumulative funding period has been provided in Appendix 7.	☑
Level of Effort Tables completed in Budget Justifications in Appendix 7: for each person for whom funding is requested in a research thrust, on the scope of activities during proposed project period.	☑
Post-submission of the application, timely submitted the Renewal Proposal Products (RPP) in PAMS.	☑

Other Funding Opportunities

- **Workforce Development (WDTS) programs:** https://science.energy.gov/wdts/
  - Office of Science Graduate Student Research fellowships (SCSGR)
    - Supports grad student research at a DOE lab, 3 to 12 months
    - Two calls per year, usually Feb/Aug.
    - Applications typically due May/Nov for following Fall or Summer start
  - Science Undergraduate Laboratory Internships (SULI)
    - Supports undergraduate research at a DOE lab, 10 to 16 weeks
    - Three calls per year, for following Spring/Summer/Fall terms
    - Now accepting applications for Spring 2018, due Oct 2
  - Visiting Faculty Program
    - Summer research support for faculty/students from historically underrepresented institutions
    - One call per year, usually in Oct. Applications due in Jan.
- **Office of Science programs:**
  - Early Career Research : https://science.energy.gov/early-career/
  - SC "Open Call" DE-FOA-0001664 [HEP uses this primarily for supplemental proposals, experimental operations support and conferences]

How to Prepare for an Early Career Proposal

- **Address the following questions:**
  - What **challenges/problems** are you trying to solve? Communicate this in the proposal.
  - Is **someone else** doing it already?
    - Alternatively, aren't those research activities already being funded elsewhere?
    - If you carry-out these efforts, why are they unique and require 'you'?
  - How does this research exploit/engage the **unique capabilities** of your institution?
  - What **resources** are needed to complete the project?
  - Does your proposal outline a **5-year timeline**, with key **deliverables and personnel profiled** during this project period? If funded, what will be the outcome after 5-years?
  - Have you led the activities that you are proposing? **Why are you a future leader in HEP?**
- **General observations of strong proposals**
  - Provide **unique** capabilities. What does not get done?
    - During preparation, PIs should address "why is it critical that I carry-out this research?"
    - How does your work impact the efforts within the international collaboration?
  - A **balanced** program: strong physics effort + a hardware project attached to an experiment, where PI takes a lead
  - For searches, discuss the **discovery reach** and do not just state: "in the absence of a signal, a 95% C.L. limit will be set."
- **Prior to submission, applicants may want to seek guidance from appropriate senior faculty and/or staff while preparing proposals (incl. narrative and budget)**
  - Applicants are encouraged to draw guidance from members within the collaboration

Intensity Frontier Early Career Awards

2016: Jennifer Raaf (Fermilab)
- "Coming in from the Cold: A High-Pressure Gaseous Argon Time Projection Chamber as an Option for the DUNE Near Detector"

2015: Phillip Barbeau (Duke University)
- "Coherent Neutrino-Nucleus Scattering: A Tool to Search for New Physics"

2015: Peter Winter (ANL)
- "Muon g-2: Precision Determination of the Magnetic Field and Enhanced Trolley Features"

2014: Xin Qian (BNL)
- "Detector Development towards Precision Measurements of Neutrino Mixing"

2013: Jelena Maricic (University of Hawaii)
- "Resolving Reactor Antineutrino Anomaly with Strong Antineutrino Source"

2012: Geralyn (Sam) Zeller (Fermilab)
- "Understanding Liquid Argon Neutrino Detectors: Moving from Art to Science"

2012: Brendan Casey (Fermilab)
- "Early Career: Tracking for the New Muon g-2 Experiment"

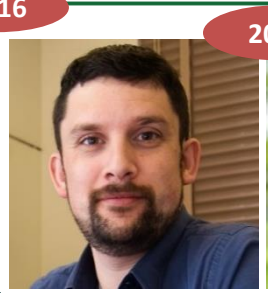
2012: Lisa Whitehead (University of Houston)
- "Precision Measurement of Electron Antineutrino Disappearance in the Daya Bay Experiment"

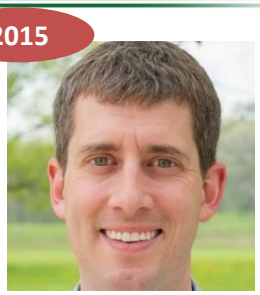
2011: Ryan Patterson (California Institute of Technology)
- "Developing novel techniques for readout, calibration and event selection in the NOvA long-baseline neutrino experiment"

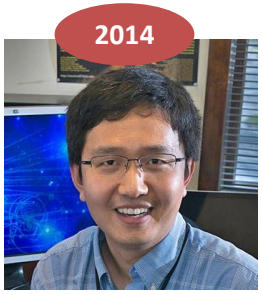
2010: Alysia Marino (University of Colorado)
- "Probing Neutrino Properties with Long-Baseline Neutrino Beams"

2010: Christopher Mauger (LANL)
- "Design of the near detectors and optimization of water and ice targets for fine-grained tracking detectors for the Fermilab Long-Baseline Neutrino Experiment"

2010: Patrick Huber (Virginia Polytechnic Institute & State University)
- "Neutrinos in the Universe"







Conclusion

- **HEP is maintaining the core of the DOE Science Mission**
  - We are delivering exciting discoveries, important scientific knowledge, and technological advances
  - We must stay focused and continue to deliver these outcomes for the nation
- **It is an exciting time to be doing Intensity Frontier science**
  - Portfolio of experiments exploring three of the Science Drivers in pursuit of discovery: *neutrinos, dark matter, exploring the unknown*
  - Opportunities for contributing to experiments at all stages of lifecycle
- **Research funding will remain competitive**
  - Federal budget process is ongoing for FY 2018, funding level is not known until an appropriations bill has been passed
  - Program priorities will continue to be driven by the P5 strategy
- **There is plenty of work to do!**
  - Scientists from all backgrounds are welcome to apply their skill sets to IF

U.S. DEPARTMENT OF
ENERGY

Office of
Science


HEP PROGRAM

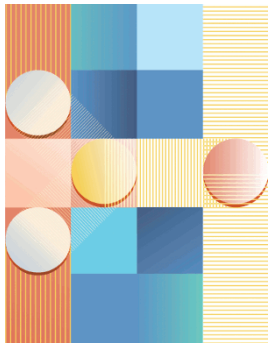
The Science Drivers of Particle Physics

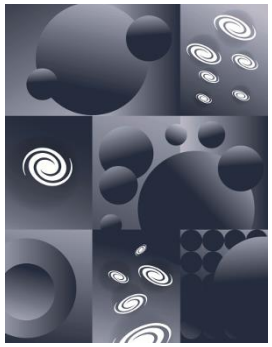
The U.S. has entered a new era of discovery.

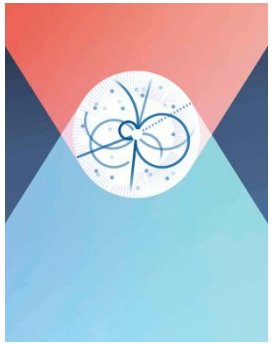
The P5 report identified five intertwined science drivers, compelling lines of inquiry that show great promise for discovery:

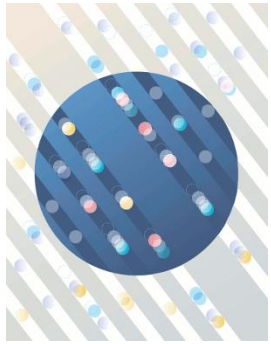
- **Use the Higgs boson as a new tool for discovery** **2013*
- **Pursue the physics associated with neutrino mass** **2015*
- **Identify the new physics of dark matter**
- **Understand cosmic acceleration: dark energy and inflation** **2011*
- **Explore the unknown: new particles, interactions, and physical principles**

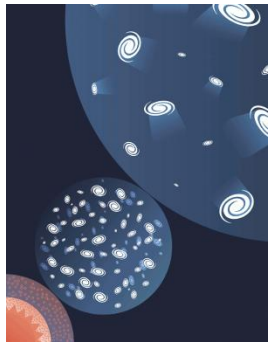
** Since 2011, three of the five science drivers have been lines of inquiry recognized with Nobel Prizes*


Higgs boson


Dark matter

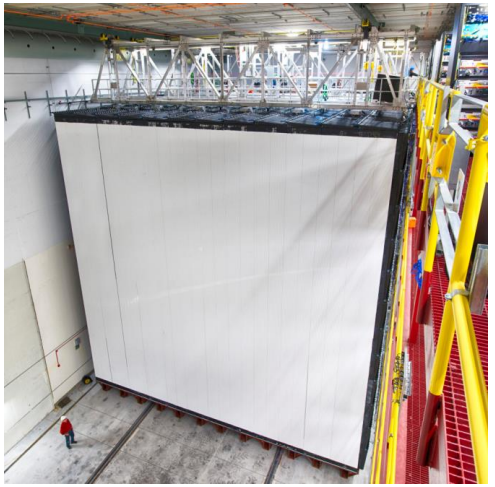

Explore the Unknown


Neutrino Mass


Cosmic acceleration

Enabling Discovery at the Intensity Frontier

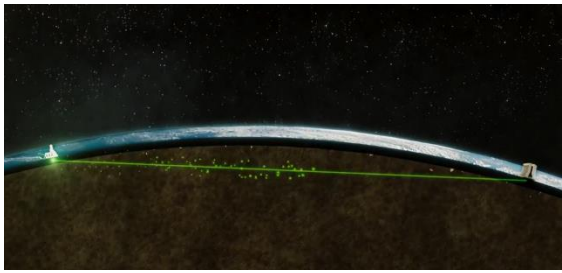
- **Intensity Frontier researchers use intense particle beams and highly sensitive detectors to make precise measurements and search for new physics**
  - Precise measurements of particle properties and studies of the rarest particle interactions predicted by the Standard Model could uncover new physics
  - Measuring the mass and other properties of neutrinos may have profound consequences for understanding the evolution and fate of the universe
- **The Intensity Frontier pursues these science drivers:**
  - Pursue the physics associated with neutrino mass
  - Identify the new physics of dark matter
  - Explore the unknown: new particles, interactions, and physical principles

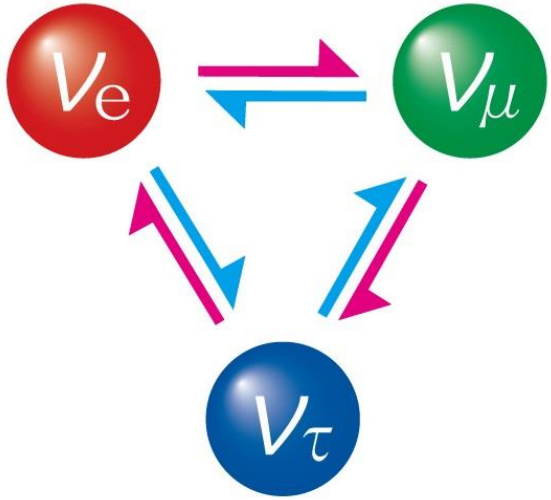


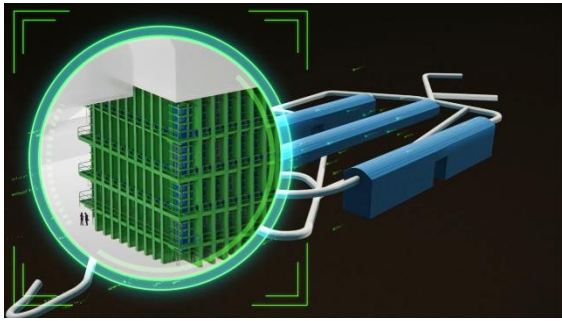
Neutrino Mass | Dark matter | Explore the Unknown

Future Transformative Discoveries from DUNE

- **By using the world's most intense neutrino beam and large, sensitive underground detectors, DUNE aims to make discoveries that could transform our understanding of the universe**
  - What is the mass ordering of neutrinos?
    - The relative mass ordering of the three known neutrinos is not yet known, but DUNE would be capable of definitively determining it.
  - Why is there an imbalance of matter and antimatter in the universe?
    - If neutrinos exhibit matter-antimatter asymmetries, they may have played a key role in creating our matter-dominated universe.
  - What happens inside a supernova?
    - Observing thousands of neutrinos from a core-collapse supernova in the Milky Way would enable unpresented insight into the process of stellar collapse and the creation of neutron stars and black holes.
  - Do protons decay?
    - With the world's largest cryogenic particle detector deep underground, DUNE will be able to observe proton decay, if it should occur, and seek a relation between the stability of matter and the Grand Unification of forces.

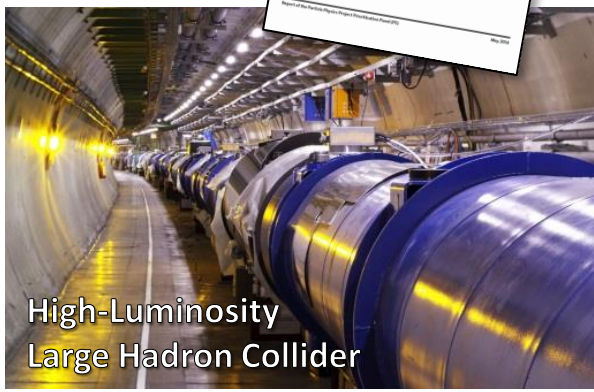


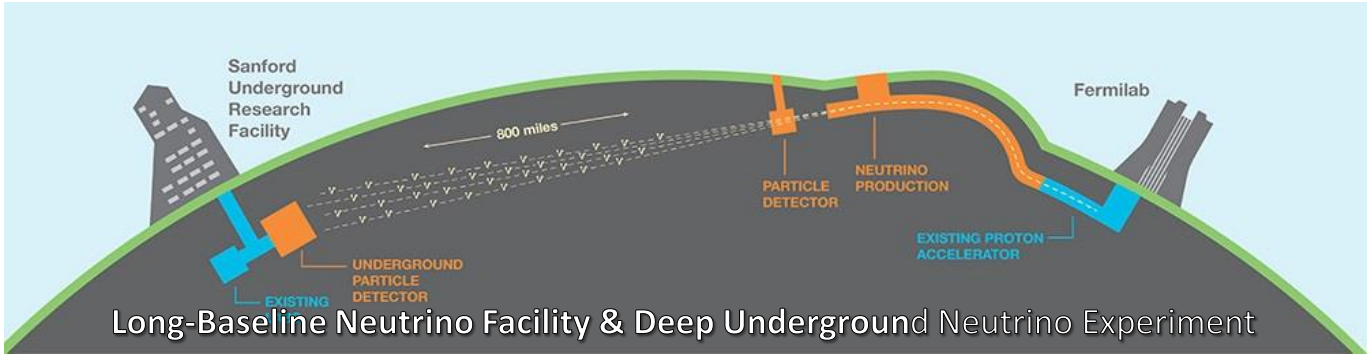




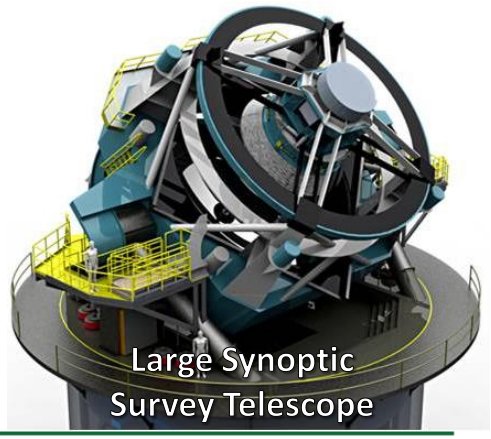
HEP FY18 President's Budget Request Strategy

- **FY 2018 Request for HEP guided by priorities of Administration, Office of Science, and P5 report strategy**
  - Currently in the midst of "Building for Discovery" to support the future program
  - Highest priority P5 projects supported with least adjustment possible to scope and schedule
  - Other efforts across Research, Facility Operations, and Projects have scope reduced or schedules delayed, based on factors including the P5 report strategy and project maturity


High-Luminosity Large Hadron Collider



Long-Baseline Neutrino Facility & Deep Underground Neutrino Experiment


Large Synoptic Survey Telescope

FY18 Request: Projects and New Initiatives

- **P5 strategy balances small & large projects, provides continuous science output. Adjustments based on factors including P5 strategy, project maturity:**
  - Projects **fully supported** in FY 2018 according to planned funding profile: ***Muon to Electron Conversion (Mu2e)***, ***LSST camera***, and ***LZ*** direct-detection dark matter
  - Projects **adjusted** in FY 2018 with respect to profiles in latest DOE Critical Decision reviews (will coordinate with other SC offices, agencies, international partners):
    - ***LBNF/DUNE*** investment growth slowed; investments made are necessary to enable international contributions
    - ***Proton Improvement Plan II (PIP-II)*** for Fermilab Accelerator Complex is slowed
    - ***High-Luminosity LHC (HL-LHC) Accelerator Upgrade Project*** and ***HL-LHC ATLAS*** and ***CMS*** detector upgrade projects are minimally adjusted
    - ***SuperCDMS-SNOLAB*** will be delayed as it transitions from design to fabrication
    - ***DESI*** project will be rebaselined
    - ***FACET-II*** accelerator project will be delayed, requiring coordination with the BES *LCLS-II* project to plan a new schedule for installation
- **New initiatives**
  - ***HL-LHC Accelerator Upgrade Project*** is a new start Major Item of Equipment (MIE) in FY 2018
  - **Quantum Information Science (QIS)** is a new area of HEP emphasis in the SC and national program, and includes quantum computing and foundational QIS, quantum sensor technology, and small experiments exploiting entanglement.

FY18 Request: Research & Facilities Operations

- **In the midst of "Building for Discovery" for the future, must keep P5 projects moving forward**
  - Research and Facilities Operations are adjusted in order to maintain project support
- **FY 2018 Request will reduce Research activities at the National Laboratories and Universities, with higher priority given to:**
  - Laboratory research programs that are critical to executing the P5 recommendations
  - R&D that requires long-term investments (i.e., "seeding the future") including Accelerator Stewardship, Detector R&D, and Quantum Information Science (QIS)
- **FY 2018 Request provides reduced funding for the Fermilab Accelerator Complex to operate and support the neutrino and muon experiments**
  - FY 2018 experiment operations will include NOvA, MicroBooNE, ICARUS, and Muon g-2
  - Proposal to run 1,800 hours of Fermilab Accelerator Complex operations (37.5% of optimal 4,800) will require further discussion with Fermilab regarding program impacts

Program Advice and Coordination

- **Formal advice (Federal Advisory Committee Act)**
  - High Energy Physics Advisory Panel (HEPAP)
    - Jointly serves DOE and National Science Foundation (NSF)
    - 2014: P5 long-term strategy report
    - 2015: Accelerator R&D Subpanel report
  - Astronomy and Astrophysics Advisory Committee (AAAC)
    - Advises DOE, NSF, and NASA on selected issues of mutual interest within the fields of astronomy and astrophysics
- **Community input**
  - National Academies of Science: Astronomy and Astrophysics Decadal Survey
    - 2010: New Worlds New Horizons in Astronomy and Astrophysics
  - Workshop reports
    - Quantum Sensors, Accelerator R&D Roadmaps, Technology Connections, etc.
- **International coordination**
  - CERN Council (LHC)
    - Governs CERN by defining its strategic programs, setting and following up its annual goals, and approving its budget
  - International Neutrino Council (LBNF/DUNE)
    - International consulting body DOE and Fermilab that facilitates high-level global coordination across the LBNF/DUNE enterprise


COMPARATIVE REVIEW PROCESS

Subprogram Review Panels

- **The Comparative Review process is very competitive and hard choices have to be made based on the reviews, as well as to fit into our limited funding availability**
  - The process implies that certain proposals and PIs will be ranked at the top, middle, and bottom
- **It is understood that the vast majority of people applying are working hard and their efforts are in support of the HEP program**
  - Due to constrained budgets, some people whose research activities and level of effort are ranked lower in terms of priority and impact relative to others in the field will not be funded on the grant
  - This does not necessarily mean the person cannot continue working on the experiments; they are not being funded by the grant to do it
    - It could be that the person has a critical role in the program, but this did not come out in the proposal or review process
  - This is why it is imperative to respond to the FOA solicitation and detail each person's efforts
- **Members of subprogram review panels see all of the proposals and each member provides input and ranks proposals relative to the others**
  - When a panel member is faced with comparing efforts, impacts and limited budgets, rather than rank the whole proposal low, they may provide guidance regarding details of the proposals
    - *e.g.*, current group size works well, therefore do not add additional postdoc on this effort

Why Perform Panel Reviews?

- **The Intensity Frontier program comprises a number of highly complex experiments and projects and new opportunities arise and evolve for research and development**
  - Discussion of proposals provides a richer context to the full Intensity Frontier HEP program compared to the 5-6 proposals each panelist reviews
- **Reviewer numeric score calibration varies and initial evaluations may be incomplete**
  - We can provide a context for calibrating scores by discussing the highest- and lowest-ranked proposals determined by the initial evaluations
  - During and following panel discussions, panelists can revise and update their reviews, scores, and rankings based on additional factual information
- **Discussion within a panel can help clarify the understanding of elements within a proposal, and thus sharpen the review narrative**
  - Most panel members collaborate on many of the experimental efforts under review, and will be able to participate in the discussion
  - *Note: Proposal assignments are anti-correlated with current research efforts*

HEP Proposal Review and Award Process

Pre-Review

- August: Letter of Intent (LOI) received from PI. Program and review planning at DOE/HEP.
- September: Proposal received. FOA compliance checks at DOE: PI qualifications, scope, page limits, budget pages, DMP, etc.

Merit Review

- Sept-October: Proposals assigned to *at least* three merit reviewers via DOE's Portfolio Analysis and Management System (PAMS);
- October-November: Reviewers' input their written evaluations in PAMS.
- November: Panel deliberations of proposals and senior investigators. Add any additional reviews and make comparative reviews & evaluations.

Post-Review and Award

- December: Assessment of each proposal and each PI by DOE/HEP using merit review, grant monitor input, programmatic priorities, budget constraints.
- Early-to-mid January: Prioritized budget guidance sent to PIs and requests for revised budgets and budget justifications using proper DOE forms.
- During the Spring: Route proposal's procurement packages through DOE/SC and DOE Chicago Operations Office for approval. Awards processed by the DOE Chicago Operations Office.

FY 2017 Comparative Review Process

- **5 out of the 151 proposals were subsequently withdrawn by the respective sponsoring institutions**
  - 3 were **duplicate** submissions and 2 were **withdrawn** at request of the PIs
  - Led to **146 proposals** into the pre-screening stage for proposal's responsiveness to the subprogram descriptions and for compliance with the FOA requirements
- **After pre-screening, 10 'complete' proposals were declined before the competition:**
  - 4 proposals declined without review for reasons of **exceeding page limits** *(requirements given in FOA)*
  - 4 proposals were submitted with **non-compliant Data Management Plans** on the management of digital data for applications requesting support for research
    - **SC-wide requirement** for research-based solicitations issued on or after October 1, 2014
  - 1 was **outside the scope** of DOE/HEP supported research
  - 1 proposal was from a 'for-profit' organization, and thus **did not meet FOA eligibility** requirement
- **Proposals that were declined for "technical" reasons could re-submit to general DOE/SC solicitation**
- **For the FY17 HEP comparative review process, 136 proposals were reviewed, evaluated and discussed by several panels of experts who met in the:**

HEP Research Subprogram	Panel Deliberations	# of Total Proposals Reviewed [includes proposals containing multiple subprograms]
HEP Theory	November 7-9, 2016	30
Detector R&D	November 8-9, 2016	21
Intensity Frontier	November 9-10, 2016	33
Cosmic Frontier	December 5-7, 2016	26
Accelerator Science and Technology R&D	December 6-7, 2016	23
Energy Frontier	December 7-9, 2016	30

FY17 Comp. Review Data — by Proposal

	HEP Subprogram						HEP Total
	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	
Reviewed	30 (7)	33 (15)	26 (8)	50 (10)	21 (17)	21 (11)	136 (69)
Funded	24 (3)	16 (2)	18 (2)	38 (6)	8 (6)	11 (2)	78 (20)
Declined	6 (4)	17 (13)	8 (6)	12 (4)	13 (11)	10 (9)	58 (49)
"Success Rate" (%) (Previous/New)	80 (91/43)	48 (78/13)	69 (89/25)	76 (80/60)	38 (50/35)	52 (90/18)	57 (88/29)

NOTES:

- **Single proposals with multiple research thrusts are counted multiple times [1/thrust]**
- ( ) indicates number of proposals from research PI/groups that did not receive DOE HEP funding previously.
- "Success Rate" is = # Funded/ # Reviewed.

FY17 Comp. Review Data — by Senior PI

	HEP Subprogram						HEP Total
	Energy	Intensity	Cosmic	Theory	Acc. R&D	Det. R&D	
Reviewed	89 (9)	67 (18)	43 (15)	133 (26)	26 (21)	38 (23)	386 (112)
Funded	75 (5)	44 (2)	26 (2)	101 (16)	10 (8)	20 (6)	267 (39)
Declined	8 (4)	23 (16)	17 (13)	23 (10)	16 (13)	18 (17)	119 (73)
"Success Rate" (%) (Previous/New)	84 (88/55)	66 (86/11)	60 (93/13)	76 (81/62)	38 (40/38)	53 (93/26)	69 (83/35)

NOTES:

- ( ) indicates number of senior investigators that did not receive DOE HEP funding previously.
- "Success Rate" is = # Funded/ # Reviewed.
- Overall success rate in FY16 for previously (newly) funded DOE HEP PIs was 85% (28%).

FY12–17 Review Data: Proposals & PIs

	HEP Total – Review by Proposals [across all 6 subprogram]					
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Received	136	185	129	146	156	146
Declined w/o Review	14	23	5	7	22	10
Reviewed	122	162 (58)	124 (71)	139 (79)	134 (69)	136 (69)
Funded	85	101 (20)	62 (17)	63 (16)	77 (20)	78 (20)
"Success Rate" (%)	70	62	50	45	57	57

	HEP Total – Review by Senior Investigators [across all 6 subprograms]					
	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017
Received	253	504	285	326	363	403
Declined w/o Review	21	42	8	13	54	17
Reviewed	232	462 (113)	277 (97)	313 (128)	309 (111)	386 (112)
Funded	162	338 (40)	178 (31)	174 (24)	199 (31)	267 (39)
"Success Rate" (%)	70	73	64	56	64	69

- ( ) indicates number of proposals or PIs that did not receive DOE HEP funding in the prior fiscal year.
- "Success Rate" is = # Funded/ # Reviewed.
- FY 2017 proposal and PI success rates at 57% and 69%, respectively; comparable to the FY 2016 review.